(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 July 2003 (03.07.2003)

PCT

(10) International Publication Number
WO 03/053479 A2

(51) International Patent Classification[7]: A61L 12/08, 12/14

(21) International Application Number: PCT/US02/39522

(22) International Filing Date:
10 December 2002 (10.12.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/342,869 20 December 2001 (20.12.2001) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 03/053479 A2

(54) Title: COMPOSITION FOR TREATING CONTACT LENSES

(57) Abstract: A method for cleaning contact lenses employs a composition that includes tromethamine in an amount effective to reduce the amount of denatured protein on the contact lens, thus rendering the contact lenses easier to clean. Additionally, by soaking contact lenses in the composition prior to inserting the lens on the eye, the compositions provide a prophylactic effect in preventing protein denaturation while the contact lens is worn.

COMPOSITION FOR TREATING CONTACT LENSES

Priority is hereby claimed in the present nonprovisional application to Provisional Application Serial Number 60/342,869 filed December 20, 2001, in accordance with 37 CFR 1.78(a)(4).

Field of the Invention:

This invention relates to compositions and methods for cleaning, and preferably also disinfecting, contact lenses. The compositions reduce the amount of denatured protein on the contact lens, thus rendering the contact lenses easier to clean. Additionally, by soaking contact lenses in the composition prior to inserting the lens on the eye, the compositions provide a prophylactic effect in preventing protein denaturation while the contact lens is worn, thus preventing denatured proteins from accumulating on the contact lens surface while worn.

Background of the Invention:

In the normal course of wearing contact lenses, tear film and debris composed of proteinaceous, oily, sebaceous, and related organic matter have a tendency to deposit and build up on lens surfaces. As part of the routine care regimen, contact lenses must be cleaned to remove these tear film deposits and debris. If these deposits are not properly removed, both

the wettability and optical clarity of the lenses are substantially reduced causing discomfort for the wearer.

Conventionally, the cleaning of contact lenses is accomplished with one or both of two general classes of cleaners. Surfactant cleaners, generally known as "daily cleaners" because of their recommended daily use, are effective for the removal of most carbohydrate and lipid derived matter. For this daily cleaning regimen, the contact lens is removed from the eye and treated with the surfactant cleaner. However, these cleaners are not as effective for the removal of proteinaceous matter such as lysozyme. Typically, proteolytic enzymes derived from plant, animal, and microbial sources are used to remove the proteinaceous deposits. These enzymatic cleaners are typically recommended for weekly use and are conventionally employed by dissolving enzyme tablets or liquid enzyme formulations in suitable aqueous solutions, where the contact lens is soaked in the solution.

Proteinaceous matter deposited on a contact lens surface mainly includes proteins native to the eye, such as lysozyme, albumin and mucin. One of the reasons proteinaceous matter deposited on a contact lens is more difficult to remove is that the proteins typically denature once they accumulate on the contact lens surface; the denaturation allows a greater hydrophobic interaction with the hydrophilic contact lens surface. In other words, denatured proteins are more difficult to remove from a contact lens

surface than native proteins. Additionally, whereas proteins native to the eye typically do not irritate the eye, denatured proteins on a contact lens surface tend to reduce comfort.

The present invention recognizes that it would be advantageous to reduce the amount of denatured protein on a contact lens, thus rendering the protein easier to remove and the contact lenses easier to clean.

U.S. Patent No. 6,096,138 (Heiler et al.) discloses compositions including a moderately charged polyquaternium polymer that may be used as either an in-the-eye or an out-of-eye inhibitor of proteinaceous deposits on hydrophilic contact lenses, where the polyquaternium polymer inhibits the deposition of protein on contact lenses.

U.S. Patent No. 5,422,073 (Mowrey-McKee et al.) discloses compositions for disinfecting contact lens containing tromethamine in an amount of 0.6 to 2 weight percent, where tromethamine has a synergistic microbicidal effect when employed with other antimicrobial agents such as polyhexamethylene biguanide (PHMB). This patent does not suggest that the tromethamine has any effect in stabilizing proteins against denaturation.

Summary of the Invention:

According to a first embodiment, this invention provides a method of reducing denatured proteins on a contact lens. This method comprises

soaking the contact lens in an aqueous composition that comprises tromethamine in an amount effective to reduce the amount of denatured protein on the contact lens. In other words, denatured proteins are "returned" to their native state, rendering the proteins easier to remove from the contact lens surface. According to various preferred embodiments, the proteins can be removed without manual rubbing of the lens, for example, by rinsing.

According to a second embodiment, this invention provides a method of preventing deposition of denatured proteins on a contact lens while worn on the eye. The method comprises soaking the contact lens in an aqueous composition, and inserting the contact lens in the eye without rinsing the composition from the contact lens, wherein the composition comprises tromethamine in an amount effective to prevent denaturation of proteins in the eye. Accordingly, proteins are stabilized against denaturation in the eye, thus reducing the amount of denatured protein to bind to the contact lens surface.

According to another embodiment, the invention provides a method of cleaning a contact lens, comprising soaking the contact lens in an aqueous composition that comprises tromethamine in an amount effective to reduce the amount of denatured protein denaturation on the contact lens, and rinsing the contact lens to remove proteins.

Detailed Description of the Invention:

The present invention may be used with all contact lenses such as conventional hard, soft, rigid and soft gas permeable, and silicone (including both hydrogel and non-hydrogel) lenses, but is preferably employed with soft hydrogel lenses. Such lenses are commonly prepared from hydrophilic monomers such as 2-hydroxyethyl(meth)acrylate, N-vinylpyrrolidone, glycerol(meth)acrylate, and (meth)acrylic acid. In the case of silicone hydrogel lenses, a silicone-containing monomer is copolymerized with at least one hydrophilic monomer. Such lenses absorb significant amounts of water, typically from 10 to 80 percent and more typically 20 to 70 percent by weight water.

The compositions employed in this invention are aqueous solutions. The compositions include, as an essential component, 2-amino-2-hydroxymethyl-1,3-propanediol, also known by the names tris(hydroxymethyl)aminomethane, tromethamine and TRIS. This compound is known as a buffer for contact lens solutions and is commercially available. In the present solutions, tromethamine is employed in amount effective to prevent or reduce denaturation of proteins, preferably at least 0.05 weight percent, more preferably 0.05 to 1%, and most preferably 0.1 to 0.5 %. Tromethamine is commercially available, for example, under the trademark Tris Amino® (Angus Chemical Company, Northbrook, Illinois).

According to various preferred embodiments, the compositions are suitable for disinfecting a contact lens soaked therein. Accordingly, in addition to water and tromethamine, it is preferred that the compositions include at least one antimicrobial agent, especially a non-oxidative antimicrobial agent which derives its antimicrobial activity through a chemical or physicochemical interaction with organisms. So that the contact lenses treated with the composition may be instilled directly in the eye, i.e., without rinsing the contact lens with a separate composition, the antimicrobial agent needs to be an ophthalmically acceptable antimicrobial agent.

Suitable antimicrobial agents include quaternary ammonium salts, which do not include significant hydrophobic portions, e.g. alkyl chains comprising more than six carbon atoms. Examples of suitable quaternary ammonium salts for use in the present invention include poly[(dimethyliminio)-2-butene-1,4-diyl chloride] and [4-tris(2-hydroxyethyl) ammonio]-2-butenyl-w-[tris(2-hydroxyethyl)ammonio] dichloride (chemical registry no. 75345-27-6) generally available as Polyquaternium™ 1 (ONYX Scientific Limited, Sunderland, United Kingdom), biguanides and their salts such as alexidine and polyhexamethylene biguanides such as PHMB available under the tradename Cosmocil™ CQ (ICI Americas, Inc., Wilmington Delaware), benzalkonium chloride (BAK), and sorbic acid.

The antimicrobial agent is present in an amount effective for disinfecting a contact lens, as in conventional lens soaking and disinfecting solutions. Preferably, a disinfecting amount is an amount which will reduce the microbial burden by a certain number of log orders within a certain period of time, depending on the particular microorganism involved. Most preferably, a disinfecting amount is an amount which will eliminate the microbial burden on a contact lens when used in regimen for the recommended soaking time (FDA Chemical Disinfection Efficacy Test - July, 1985 Contact Lens Solution Draft Guidelines). It is noted that, unlike the aforementioned U.S. Patent No. 5,422,073, tromethamine does not necessarily need to be employed at higher concentrations such that tromethamine contributes to the disinfection efficacy of the composition. In other words, although relatively high amounts of tromethamine may be employed in the present compositions, it has been found in the present invention that lower amounts of tromethamine may be employed to achieve the desired protein stabilization than the amounts required in U.S. Patent No. 5,422,073 for disinfection efficacy. Accordingly, for various preferred embodiments, the antimicrobial agent is present in an amount effective to disinfect the contact lens, where this amount is effective even in a comparable composition lacking any tromethamine.

The subject compositions may contain various other components including, but not limited to chelating and/or sequestering agents, osmolality adjusting agents, surfactants and/or wetting agents.

Chelating agents, also referred to as sequestering agents, are frequently employed in conjunction with antimicrobial agents. These agents bind heavy metal ions, which might otherwise react with the lens and/or protein deposits and collect on the lens. Chelating agents are well known in the art, and examples of preferred chelating agents include ethylenediaminetetraacetic acid (EDTA) and its salts, especially disodium EDTA. Such agents are normally employed in amounts from about 0.01 to about 2.0 weight percent, more preferably from about 0.01 to about 0.3 weight percent. Other suitable sequestering agents include gluconic acid, citric acid, tartaric acid and their salts, e.g. sodium salts.

The subject composition may be designed for a variety of osmolalities, but it is preferred that the composition is iso-osmal with respect to eye fluids. Specifically, it is preferred that the composition has an osmotic value of less than about 350 mOsm/kg, more preferably from about 175 to about 330 mOsm/kg, and most preferably from about 280 to about 320 mOsm/Kg. At least one osmolality adjusting agent may be employed in the composition to obtain the desired final osmolality. Examples of suitable osmolality adjusting agents include, but are not limited to sodium and

potassium chloride, monosaccharides such as dextrose, calcium and magnesium chloride, and low molecular weight polyols such as glycerin and propylene glycol. Typically, these agents are used individually in amounts ranging from about 0.01 to 5 weight percent and preferably, from about 0.1 to about 2 weight percent.

The subject composition has an ophthalmically compatible pH, which generally will range between about 6 to about 8, and more preferably between 6.5 to 7.8, and most preferably about 7 to 7.5. Conventional buffers may be employed to obtain the desired pH value. As mentioned, tromethamine is known as a buffer for contact lens treating compositions. However, the compositions may include a supplemental buffering agent. In other words, the subject composition may include a "mixed buffer" of tromethamine and one or more supplemental buffer agents. Suitable buffers include borate buffers based on boric acid and/or sodium borate, phosphate buffers based on Na_2HPO_4, NaH_2PO_4 and/or KH_2PO_4, a citrate buffer based on potassium citrate and/or citric acid, sodium bicarbonate, and combinations thereof. Generally, buffers will be used in amounts ranging from about 0.05 to 2.5 weight percent, and preferably, from 0.1 to 1.5 weight percent.

The subject compositions may include a wetting agent to facilitate the composition wetting the surface of a contact lens soaked therein. Within the art, the term "humectant" is also commonly used to describe these materials.

A first class of wetting agents are polymer wetting agents. Examples include polyvinyl alcohol (PVA), polyvinyl pyrrolidone (PVP), cellulose derivatives and polyethylene glycol. Cellulose derivatives and PVA may be used to also increase viscosity of the composition, and offer this advantage if desired. Specific cellulose derivatives include hydroxypropyl methyl cellulose, carboxymethyl cellulose, methyl cellulose, hydroxyethyl cellulose, and cationic cellulose derivatives. As disclosed in U.S. Patent No. 6,274,133, cationic cellulosic polymers also help prevent accumulation of lipids and proteins on a hydrophilic lens surface. Such polymers include commercially available water soluble polymers available under the CTFA (Cosmetic, Toiletry, and Fragrance Association) designation Polyquaternium-10, including the cationic cellulosic polymers available under the tradename UCARE® Polymer (Amerchol Corp., Edison, N.J.). Generally, these cationic cellulose polymers contain quaternized N,N-dimethyl amino groups along the cellulosic polymer chain.

Another class of wetting agents is non-polymeric wetting agents. Examples include glycerin, propylene glycol, and other non-polymeric diols and glycols.

The specific quantities of wetting agents used in the present invention will vary depending upon the application. However, the wetting agents will typically be included in an amount from about 0.01 to about 5 weight percent, preferably from about 0.1 to about 2 weight percent.

It will be understood that some components possess more than one functional attribute. For example, as mentioned, tromethamine provides the effect of preventing protein denaturation, but also contributes a buffering effect. Cellulose derivatives are suitable polymeric wetting agents, but are also referred to as "viscosity increasing agents" to increase viscosity of the composition if desired. Glycerin is a suitable non-polymeric wetting agent but may also contribute to adjusting tonicity.

The subject composition may include at least one ophthalmically acceptable surfactant, which may be either cationic, anionic, nonionic or amphoteric. Preferred surfactants are amphoteric or nonionic surfactants. The surfactant should be soluble in the aqueous solution and non-irritating to eye tissues. The surfactant serves mainly to facilitate removal of non-proteinaceous matter on the contact lens.

Many nonionic surfactants comprise one or more chains or polymeric components having oxyalkylene (-O-R-) repeats units wherein R has 2 to 6 carbon atoms. Representative non-ionic surfactants comprise block polymers of two or more different kinds of oxyalkylene repeat units, which

ratio of different repeat units determines the HLB of the surfactant. For example, poloxamers are polyoxyethylene, polyoxypropylene block polymers and available under the tradename Pluronic™ (BASF Wyandotte Corp., Wyandotte, Michigan). Poloxamines are ethylene diamine adducts of such polyoxyethylene, polyoxypropylene block polymers available under the tradename Tetronic™ (BASF Wyandotte Corp.), including poloxamine 1107 (Tetronic 1107) having a molecular weight from about 7,500 to about 27,000 wherein at least 40 weight percent of said adduct is poly(oxyethylene). Other non-ionic surfactants include polyethylene glycol esters of fatty acids, e.g. coconut, polysorbate, polyoxyethylene or polyoxypropylene ethers of higher alkanes (C_{12}-C_{18}), polysorbate 20 available under the trademark Tween® 20 (Sigma Aldrich Company, St. Louis, Missouri), polyoxyethylene (23) lauryl ether available under the tradename Brij® 35 (Sigma Aldrich Company), polyoxyethyene (40) stearate available under the tradename Myrj® 52 (Sigma Aldrich Company), and polyoxyethylene (25) propylene glycol stearate available under the tradename Atlas® G 2612 (Sigma Aldrich Company).

Another useful class of surfactants are the hydroxyalkylphosphonates, such as those disclosed in U.S. Patent No. 5,858,937 (Richards et al.), and available under the tradename Dequest® (Montsanto Co., St. Louis, Missouri).

Amphoteric surfactants suitable for use in a composition according to the present invention include materials of the type offered commercially under the trade name Miranol™ (Rhodia HPCII, Cranbury, New Jersey). Another useful class of amphoteric surfactants is exemplified by cocoamidopropyl betaine, commercially available from various sources.

Various other ionic as well as amphoteric and anionic surfactants suitable for in the invention can be readily ascertained, in view of the foregoing description, from *McCutcheon's Detergents and Emulsifiers*, North American Edition, McCutcheon Division, MC Publishing Co., Glen Rock, NJ 07452 and the *CTFA International Cosmetic Ingredient Handbook*, Published by The Cosmetic, Toiletry, and Fragrance Association, Washington, D.C.

Preferably, the surfactants, when present, are employed in a total amount from about 0.01 to about 15 weight percent, preferably 0.1 to 5.0 weight percent, and most preferably 0.1 to 1.5 weight percent.

As an illustration of the present invention, several examples are provided below. These examples serve only to further illustrate aspects of the invention and should not be construed as limiting the invention.

Example 1.

A series of 10-ml test solutions, listed in Table 1 below, were prepared. Each solution included saline and 20mM of buffering agent as specified in Table 1 below. To each test solution was added 1mg/ml of hen egg lysozyme as well as a phosphate buffered saline (PBS) control. The test solutions were mixed slowly with a stir bar until the lysozyme was incorporated into the solutions. Five ml of each lysozyme-containing test solution was retained as the unheated control. The remaining 5 ml of each lysozyme-containing test solution were placed in glass less vials, capped with silicone stoppers and incubated in a shaking water bath at 80°C, 40 revolutions per minute (rpm) for 1 hour – these heating conditions are sufficient to denature the lysozyme, absent a stabilization effect provided by the buffering agents.

The vials were allowed to come to ambient temperature before testing. A 0.00025g/ml suspension of M. luteus was prepared from lyophilized cells in PBS. The suspension was continually mixed on a stir plate during the testing period to prevent the suspension from settling.

For each set of test solutions, the following were tested (sample): a heated lysozyme-containing test solution ("lysozyme+heat"); an unheated lysozyme-containing test solution ("lysozyme/no heat"; and a test solution without lysozyme ("no lysozyme"). One ml of each sample was placed into a

glass test tube to which 9 ml of M. luteus suspension was added and vortexed. A 1-ml sub-sample was placed into a disposable cuvette and evaluated on a UV-vis spectrophotometer at 450nm. This procedure was performed for each sample at 0, 5 and 10 minutes. Each of the solutions were evaluated in triplicate. Each of the three optical density measurements from the triplicate samples were averaged. The resulting mean value for the 5 and 10 minute time points was used to determine the Percentage Change at the 5 and 10 minute time points.

As can be seen in Table 1, the compositions containing tromethamine were generally more effective at stabilizing the protein against denaturation. Thus, these compositions are expected to reduce the amount of denatured protein that bind to a contact lens surface, noting that native protein is removed from a contact lens relatively easily, whereas denatured protein adheres tenaciously to a contact lens surface.

Table 1

		Time			Percent Change	
Solution	Treatment	0 Min	5 Min	10 Min	5 Min	10 Min
Borate	lysozyme/no heat	0.619	0.053	0.034	91.44	94.51
	lysozyme+heat	**0.872**	**0.681**	**0.390**	**21.90**	**55.28**
	no lysozyme	0.853	0.853	0.854	0.00	-0.12
Phosphate	lysozyme/no heat	0.634	0.052	0.029	91.80	95.43
	lysozyme+heat	**0.861**	**0.858**	**0.852**	**0.34**	**1.05**
	no lysozyme	0.856	0.852	0.854	0.47	0.23
Tris	lysozyme/no heat	0.654	0.048	0.028	92.66	95.72
	lysozyme+heat	**0.810**	**0.154**	**0.117**	**80.99**	**85.56**
	no lysozyme	0.859	0.854	0.854	0.58	0.58
Dequest	lysozyme/no heat	0.629	0.051	0.032	91.89	94.91
	lysozyme+heat	**0.857**	**0.848**	**0.842**	**1.05**	**1.75**
	no lysozyme	0.852	0.850	0.848	0.23	0.47
Citrate	lysozyme/no heat	0.654	0.049	0.030	92.51	95.41
	lysozyme+heat	**0.877**	**0.851**	**0.785**	**2.96**	**10.49**
	no lysozyme	0.857	0.850	0.850	0.82	0.82

Table 1 - Continued

Solution	Treatment	Time 0 Min	Time 5 Min	Time 10 Min	Percent Change 5 Min	Percent Change 10 Min
Citrate +	lysozyme/no heat	0.611	0.057	0.037	90.67	93.94
Phosphate	lysozyme+heat	**0.864**	**0.839**	**0.827**	**2.89**	**4.28**
	no lysozyme	0.852	0.849	0.856	0.35	-0.47
Citrate +	lysozyme/no heat	0.602	0.050	0.033	91.69	94.52
Borate	lysozyme+heat	**0.854**	**0.817**	**0.785**	**4.33**	**8.08**
	no lysozyme	0.848	0.844	0.846	0.47	0.24
Borate +	lysozyme/no heat	0.564	0.051	0.036	90.96	93.62
Tris	lysozyme+heat	**0.836**	**0.216**	**0.167**	**74.16**	**80.02**
	no lysozyme	0.847	0.841	0.843	0.71	0.47
Phosphate +	lysozyme/no heat	0.598	0.050	0.031	91.64	94.82
Borate	lysozyme+heat	**0.847**	**0.841**	**0.838**	**0.71**	**1.06**
	no lysozyme	0.848	0.852	0.847	-0.47	0.12
Tris +	lysozyme/no heat	0.575	0.048	0.030	91.65	94.78
Dequest	lysozyme+heat	**0.846**	**0.605**	**0.349**	**29.98**	**59.61**
	no lysozyme	0.830	0.843	0.843	-1.57	-1.57

Table 1 - Continued

		Time			Percent Change	
Solution	**Treatment**	**0 Min**	**5 Min**	**10 Min**	**5 Min**	**10 Min**
M. Luteus + PBS – Control	no lysozyme	0.836	0.849	0.838	-1.56	-0.24

Examples 2 through 5.

Representative compositions of the present invention are set forth below in Table 2. The compositions identified in Table 2 as Examples 2 through 5 were prepared according to the following method. The non-polymeric components, such as tromethamine, tromethamine HCl, sodium chloride, EDTA, Dequest, sodium borate and boric acid, were added sequentially to a volume of heated water (about 50°C) that amounts to about 70-85% of the final batch volume. This addition was done under constant agitation, and each component was allowed to dissolve or disperse before adding the next component. Subsequently, Tetronic 1107 and PHMB were added under agitation, ensuring adequate dispersion of the polymer. The resulting solution was mixed until complete dissolution was achieved. The batch was cooled under agitation to room temperature. The pH was adjusted to about 7.1-7.5 by incrementally adding 1N NaOH or 1N HCl, and then the final volume was achieved by adding water (at 20-30°C) and mixing for at least 15 minutes.

Table 2

Ingredients (w/w%)	Example 2	Example 3	Example 4	Example 5
Boric Acid	0.121	0.66	0.0618	-
Sodium Borate	0.0183	0.1	-	-
Triethanolamine	-	**0.129**	**0.121**	-
Triethanolamine	-	**0.15**	-	**0.1576**
Dequest 2016 30%	0.1	0.1	0.1	0.98
Tetronic 1107	1	1	1	1
EDTA	0.11	0.11	0.11	0.11
NaCl	0.758	0.716	0.82	0.655
PHMB	1 ppm	1 ppm	1 ppm	1 ppm
1 N HCl or NaOH	Adjust pH 7.1 to 7.5			
Purified water	q.s. to 100			

The compositions identified as Examples 2 through 5 in Table 2 above, along with the marketed multi-purpose solutions identified in Table 3 below, were tested according to the procedure described in Example 1 the results of which are set forth below in Table 4.

Table 3

Marketed Multi-Purpose Solution	**Buffer System**
MP A	Borate
MP B	Borate/Citrate
MP C	Phosphate
MP D	Phosphate

As shown by the data presented in Table 4 below, the multi-purpose solutions containing tromethamine were generally more effective at stabilizing the protein against denaturation.

Table 4

Solution	Treatment	Time 0 Min	5 Min	10 Min	Percent Change 5 Min	10 Min
Example 2	lysozyme/no heat	0.771	0.087	0.056	88.67	92.78
	lysozyme+heat	**1.019**	**0.770**	**0.501**	**24.46**	**50.85**
	no lysozyme	1.006	1.001	1.002	0.50	0.40
Example 3	lysozyme/no heat	0.807	0.078	0.05	90.29	93.80
	lysozyme+heat	**0.965**	**0.175**	**0.139**	**81.86**	**85.59**
	no lysozyme	0.958	1.002	0.998	-4.66	-4.21
Example 4	lysozyme/no heat	0.737	0.107	0.055	85.48	92.53
	lysozyme+heat	**0.991**	**0.289**	**0.181**	**70.80**	**81.74**
	no lysozyme	0.999	0.996	0.992	0.33	0.70
Example 5	lysozyme/no heat	0.777	0.081	0.051	89.62	93.48
	lysozyme+heat	**1.008**	**0.611**	**0.3363**		**39.38**
66.63						
	no lysozyme	0.996	0.989	0.986	0.74	1.04
MP A	lysozyme/no heat	0.716	0.093	0.054	86.96	92.41
	lysozyme+heat	**1.022**	**1.003**	**0.984**	**1.83**	**3.72**
	no lysozyme	1.008	1.004	1.000	0.46	0.83

Table 4 - Continued

		Time			Percent Change	
Solution	**Treatment**	**0 Min**	**5 Min**	**10 Min**	**5 Min**	**10 Min**
MP B	lysozyme/no heat	0.822	0.119	0.064	85.53	92.22
	lysozyme+heat	**1.001**	**0.996**	**1.000**	**0.43**	**0.03**
	no lysozyme	0.993	0.989	0.985	0.44	0.81
MP C	lysozyme/no heat	0.770	0.099	0.056	87.06	92.68
	lysozyme+heat	**1.192**	**1.180**	**1.174**	**0.98**	**1.51**
	no lysozyme	0.980	0.976	0.974	0.41	0.65
MP D	lysozyme/no heat	0.767	0.079	0.048	89.62	93.74
	lysozyme+heat	**0.996**	**0.980**	**0.969**	**1.57**	**2.71**
	no lysozyme	0.989	0.982	0.981	0.64	0.74
M. Luteus + **PBS – Control**	no lysozyme	0.884	0.881	0.879	0.30	0.45

Although various preferred embodiments have been illustrated, many other modifications and variations of the present invention are possible to the skilled practitioner. It is therefore understood that, within the scope of the claims, the present invention can be practiced other than as herein specifically described.

We claim:

1. A method of reducing denatured proteins on a contact lens, comprising soaking the contact lens in an aqueous composition that comprises tromethamine in an amount effective to reduce the amount of denatured protein on the contact lens.

2. The method of claim 1, wherein the composition further comprises at least one member selected from the group consisting of an antimicrobial agent, a buffering agent, a chelating agent, an osmolality adjusting agent, and a surfactant.

3. The method of claim 1, wherein the composition further comprises an antimicrobial agent in an amount effective to disinfect the contact lens, said amount being an amount effective in the absence of tromethamine.

4. The method of claim 3, wherein the composition comprises 0.05 to 0.5 weight percent of tromethamine

5. The method of claim 4, wherein the composition further comprises a chelating agent, and a buffering agent selected from the group consisting borate buffers, phosphate buffers and citrate buffers.

6. The method of claim 5, wherein the composition further comprises a surfactant.

7. The method of claim 6, wherein the composition comprises at least one member selected from the group consisting of poloxamer and poloxamine surfactants.

8. A method of preventing deposition of denatured proteins on a contact lens while worn on the eye, comprising soaking the contact lens in an aqueous composition, and inserting the contact lens in the eye without rinsing the composition from the contact lens, wherein the composition comprises tromethamine in an amount effective to prevent denaturation of proteins in the eye.

9. The method of claim 8, wherein the composition further comprises at least one member selected from the group consisting of an antimicrobial agent, a buffering agent, a chelating agent, an osmolality adjusting agent, and a surfactant.

10. The method of claim 8, wherein the composition further comprises an antimicrobial agent in an amount effective to disinfect the contact lens, said amount being an amount effective in the absence of tromethamine.

11. The method of claim 10, wherein the composition comprises 0.05 to 0.5 weight percent of tromethamine

12. The method of claim 11, wherein the composition further comprises a chelating agent, and a buffering agent selected from the group consisting borate buffers, phosphate buffers and citrate buffers.

13. The method of claim 12, wherein the composition further comprises a surfactant.

14. The method of claim 13, wherein the composition comprises at least one member selected from the group consisting of poloxamer and poloxamine surfactants.

15. A method of cleaning a contact lens, comprising soaking the contact lens in an aqueous composition that comprises tromethamine in an amount effective to reduce the amount of denatured protein on the contact lens, and rinsing the contact lens to remove proteins.

16. The method of claim 15, wherein the proteins are removed without manual rubbing.

17. The method of claim 15, wherein the contact lens is rinsed with said solution and then inserted directly into the eye.

18. The method of claim 15, wherein the composition includes an antimicrobial agent, and the contact lens is disinfected while soaked in the aqueous composition.

19. The method of claim 18, wherein the antimicrobial agent is present in an amount effective to disinfect the contact lens, said amount being an amount effective in the absence of tromethamine.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 July 2003 (03.07.2003)

PCT

(10) International Publication Number
WO 03/053479 A3

(51) International Patent Classification[7]: A61L 12/08, 12/14

(21) International Application Number: PCT/US02/39522

(22) International Filing Date:
10 December 2002 (10.12.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/342,869 20 December 2001 (20.12.2001) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR).

Published:
— *with international search report*

(88) Date of publication of the international search report:
23 October 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 03/053479 A3

(54) Title: COMPOSITION FOR TREATING CONTACT LENSES

(57) Abstract: A method for cleaning contact lenses employs a composition that includes tromethamine in an amount effective to reduce the amount of denatured protein on the contact lens, thus rendering the contact lenses easier to clean. Additionally, by soaking contact lenses in the composition prior to inserting the lens on the eye, the compositions provide a prophylactic effect in preventing protein denaturation while the contact lens is worn.

INTERNATIONAL SEARCH REPORT

Interna... Application No
PCT/US 02/39522

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L12/08 A61L12/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, MEDLINE, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 817 277 A (MOWREY-MCKEE MARY ET AL) 6 October 1998 (1998-10-06) column 1, line 44-55 column 2, line 24-30 column 2, line 36 -column 3, line 9 column 3, line 20 -column 4, line 8 claims 1,5-8,11-13; example 3	1-7, 15-19
X	US 5 356 555 A (LAM SAM W ET AL) 18 October 1994 (1994-10-18) claim 1; example 6	1-7, 15-19
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
27 May 2003	05/06/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Jochheim, J

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INTERNATIONAL SEARCH REPORT

Intern... Application No
PCT/US 02/39522

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 104 187 A (SIBLEY MURRAY J ET AL) 1 August 1978 (1978-08-01) column 1, line 60 -column 2, line 2; claim 1	1,15
A	US 5 451 237 A (VEHIGE JOSEPH G) 19 September 1995 (1995-09-19) column 2, line 43 -column 3, line 27 column 4, line 5-18 column 7, line 29-37; example 3	8-14

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/39522

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-7, 15-19

A method of reducing denatured proteins on a contact lens, comprising soaking the contact lens in an aqueous composition that comprises tromethamine.
In a further embodiement rinsing the contact lens to remove proteins.

2. Claims: 8-14

A method of preventing deposition of denatured proteins on a contact lens while worn in the eye, comprising soaking the contact lens in an aqueous composition that comprises tromethamine and inserting the lens in the eye without rinsing the composition from it.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/39522

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